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Alex sets a mind-boggling puzzle every Monday in the Guardian. His new book *Can You Solve My Problems? A Casebook of Ingenious, Perplexing and Totally Satisfying Puzzles* is available from the Guardian Bookshop and other retailers. His children's book *Football School: Where Football Explains the World* was recently shortlisted for the Blue Peter Book Award 2017.

CAN YOU SOLVE IT?

10

NEW YEAR, NEW NUMBER, NEW EQUATION

Complete the countdown conundrum

$$10\ 9\ 8\ 7\ 6\ 5\ 4\ 3\ 2\ 1 = 2017$$

Here in Numberland, we always knew that 2016 was going to be a bad one, since:

$$2016 = 666 + 666 + 666 + 6 + 6 + 6$$

But that's last year's news. What's the story about 2017, arithmetically speaking?

Well, 2017 is a prime number - the first since 2011, and the last until 2027. (Prime numbers are those numbers that are only divisible by themselves and 1.)

More notably, 2017 is the smallest whole number whose cube root begins with ten distinct digits:

$$20171/3 = 12.63480759....$$

Wowza! At the beginning of a new year, many mathematically curious folk spend time looking for satisfying number patterns like this one involving the new date.

Just so you are not left out of the fun, this puzzle is to fill the blanks in the following equation, so that it makes arithmetical sense:

$$10\ 9\ 8\ 7\ 6\ 5\ 4\ 3\ 2\ 1 = 2017$$

You can use any of the basic mathematical operations, +, -, x, ÷, and as many brackets as you like. So, an answer might look something like $(10 + 9 + 8) \times (7 - 6 - 5) / (4 + 3 + 2 + 1) = 2017$, although not this one since this is incorrect.

I do this 'countdown equation' every year.

Because 2017 is prime, it is a little bit more difficult than last year's equation where the numbers had to equal 2016. In fact, there are only 652 solutions this year, compared with 890 solutions for last year, according to my computer programmer pal Zefram. (Many of these solutions are similar).

Got that? Now let's raise the stakes. Can you do the same to this equation, which is the same as above but with the 10 deleted:

$$9\ 8\ 7\ 6\ 5\ 4\ 3\ 2\ 1 = 2017$$

There are only 107 solutions to this one.

Now you have a taste for this puzzle, fill in the equation with the 9 deleted too:

$$8\ 7\ 6\ 5\ 4\ 3\ 2\ 1 = 2017$$

This one only has 13 solutions. It's interesting that each time we remove a number the solution space shrinks by a factor of about seven.

We have to end there, since there are no solutions when only seven digits are left.

I stipulated above that you must use only the four basic mathematical operations. But of course, if you want to show off, you can use whatever arcane or complicated mathematical operations you want.